

## CLAIMS

I claim:

1. A method for environmental monitoring and bioprospecting for microorganisms within a specified environment, said method comprising the steps of:
  - locating a testing device in said environment,
  - wherein said device including a container having a fluid inlet and outlet, said container configured for entry, in situ use and exit from said environment, a plurality of capillary microcosms situated within said container, each of said capillaries having a capillary inlet and outlet that are configured so as to allow for fluid flow through said capillaries, each of said capillaries further having a means for covering said capillary inlet and outlet so as to prevent flow through said capillary,
  - placing in at least one of said capillaries a means for fostering the collection of microorganisms that are indigenous to said surrounding environment when fluid from said surrounding environment is allowed to flow through said capillary,
  - opening said capillary covering means so as to allow fluid from said surrounding environment to flow through said container and capillaries,
  - leaving said device in said environment for a temporal duration sufficient to study phenomena occurring within said capillary microcosms,
  - retrieving said testing device, and
  - analyzing phenomena occurring within said capillary microcosms.
2. A method as recited in Claim 1 wherein said device further including a pump connected to said container, said pump being configured so as to cause the flow of fluid from said surrounding environment into said container inlet and through said capillaries, a means for collecting said fluid that flows through said capillaries, and a check valve connected downstream of said container to prevent the backflow of said fluid into said container.
3. A method as recited in Claim 1 wherein said plurality of capillaries being configured so as to allow for automated analysis of said capillaries using commercially available robotics.

1 4. A method as recited in Claim 2 wherein said plurality of capillaries being  
2 configured so as to allow for automated analysis of said capillaries using  
3 commercially available robotics.

4 5. A method as recited in Claim 1 wherein said plurality of capillaries being  
5 configured in the form of rapidly, exchangeable microtiter plates.

6 6. A method as recited in Claim 2 wherein said plurality of capillaries being  
7 configured in the form of rapidly, exchangeable microtiter plates.

8 7. A method as recited in Claim 5 wherein the content of said microtiter plates being  
9 lyophilized and vacuum sealed.

10 8. A method as recited in Claim 6 wherein the content of said microtiter plates being  
11 lyophilized and vacuum sealed.

12 9. A method as recited in Claim 1, further comprising the step of:

13 before locating said device, placing in at least one of said capillaries a means  
14 for containing a specified test substance that can diffuse into the fluid flowing  
15 through said capillary.

16 10. A method as recited in Claim 2, further comprising the step of:

17 before locating said device, placing in at least one of said capillaries a means  
18 for containing a specified test substance that can diffuse into the fluid flowing  
19 through said capillary.

20 11. A method as recited in Claim 3, further comprising the step of:

21 before locating said device, placing in at least one of said capillaries a means  
22 for containing a specified test substance that can diffuse into the fluid flowing  
23 through said capillary.

24 12 A method as recited in Claim 4, further comprising the step of:

25 before locating said device, placing in at least one of said capillaries a means  
26 for containing a specified test substance that can diffuse into the fluid flowing  
27 through said capillary.

28 13. A method as recited in Claim 1, further comprising the step of:

29 before locating said device, configuring a capillary microcosm so as to aid in  
30 addressing research interests chosen from the group consisting of:

1           the identification and linking of the microbial function occurring in  
2           said environment to phylogeny, wherein at least one of said capillaries having  
3           placed therein an isotope labeled test compound that can be used in  
4           conjunction with SIP,

5           the identification and linking of the microbial function occurring in  
6           said environment to phylogeny, wherein at least one of said capillaries having  
7           placed therein an isotope labeled test compound that can be used in  
8           conjunction with mass spectrometry,

9           the survival in said environment of a specified microorganism,  
10          wherein at least one of said capillaries having placed therein said specified  
11          microorganism,

12          the fate in said environment of a specified, genetically engineered  
13          microorganism, wherein at least one of said capillaries is configured to  
14          contain said genetically engineered microorganism,

15          the fate in said environment of a specified pathogen, wherein at least  
16          one of said capillaries is configured to contain said pathogen,

17          for a specified process in said environment, the effectiveness of  
18          specified, varying test substances for their ability to accelerate said process,  
19          wherein said test substances are added to said capillaries,

20          the identification of microorganisms indigenous to said environment  
21          that are responsible for a desired bioremediation process in said environment,

22          the effectiveness of said varying bioremediation strategies for said  
23          environment, wherein said microcosms are configured to be representative of  
24          said varying bioremediation strategies,

25          the effectiveness of said varying bioaugmentation strategies for said  
26          environment, wherein said microcosms are configured to be representative of  
27          said varying bioaugmentation strategies,

28          the effectiveness of said varying chemical treatment strategies for said  
29          environment, wherein said microcosms are configured to be representative of  
30          said varying chemical treatment strategies,

1           the intrinsic transformation rates in said environment when said  
2 environment is contaminated with a specified contaminant,  
3           the enhanced transformation rates in said environment when said  
4 environment is contaminated with a specified contaminant, wherein specified  
5 nutrients are added to said capillary microcosms,  
6           the analysis of the microbial community indigenous to said  
7 environment,  
8           the proteomic analysis of the microbial community indigenous to said  
9 environment,  
10          the discovery within said environment of novel microorganisms of  
11 potential commercial value,  
12          the discovery within said environment of novel biochemical processes  
13 of potential commercial value,  
14          the discovery within said environment of novel natural products of  
15 potential commercial value,  
16          the normalization of the test results achieved with said device for  
17 differences between when and where said tests are conducted, wherein at least  
18 one of said microcosms is configured to serve as an internal standard to which  
19 said results can be normalized,  
20          the means for enhancing the signal-to-noise ratio in the mass  
21 spectrometric analysis of a specified microorganism, wherein at least one of  
22 said microcosm configured to foster the growth of said microorganism while  
23 limiting the growth and survival of other, non-specified microorganisms,  
24          the determination of the fate of a specified compound in said  
25 environment for the purpose of chemical risk assessment, wherein at least one  
26 of said microcosms having placed therein said compound,  
27          the determination of the effect of a specified compound on the  
28 microbial community of said environment for the purpose of chemical risk  
29 assessment, wherein at least one of said microcosms having placed therein  
30 said compound,

1           the determination of the fate of a specified microorganism for the  
2           purpose of biological risk assessment, wherein at least one of said microcosms  
3           having placed therein said microorganism,

4           the determination of the effect of a specified microorganism on the  
5           microbial community of said environment for the purpose of biological risk  
6           assessment, wherein at least one of said microcosms having placed therein  
7           said specified microorganism,

8           the determination, for environmental monitoring purposes, of the  
9           effect of a specified agent in said environment, wherein at least one of said  
10          microcosms having placed therein said agent, said placement being such that  
11          said agent is retrievable from said microcosm,

12          the determination, for risk assessment purposes, of the effect of a  
13          specified agent in said environment, wherein at least one of said microcosms  
14          having placed therein said agent, said placement being such that said agent is  
15          retrievable from said microcosm,

16          the determination, for environmental treatment purposes of the effect  
17          of a specified agent in said environment, wherein at least one of said  
18          microcosms having placed therein said agent, said placement being such that  
19          said agent is retrievable from said microcosm,

20          the determination, for environmental monitoring purposes, of the  
21          effect of a specified agent in said environment, wherein at least one of said  
22          microcosms having placed therein said agent and said device being configured  
23          such that said fluid from the surrounding environment that comes into contact  
24          with said agent in said microcosm is retrievable,

25          the determination, for risk assessment purposes, of the effect of a  
26          specified agent in said environment, wherein at least one of said microcosms  
27          having placed therein said agent and said device being configured such that  
28          said fluid from the surrounding environment that comes into contact with said  
29          agent in said microcosm is retrievable,

30          the determination, for environment treatment purposes, of the effect of  
31          a specified agent in said environment, wherein at least one of said microcosms

1 having placed therein said agent and said device being configured such that  
2 said fluid from the surrounding environment that comes into contact with said  
3 agent in said microcosm is retrievable,

4 the determination, for environmental monitoring purposes, of the  
5 effect of a specified biochemical process in said environment, wherein said  
6 microcosm covering means being configured so that the duration of said  
7 process in said microcosm is controllable,

8 the determination, for risk assessment purposes, of the effect of a  
9 specified biochemical process in said environment, wherein said microcosm  
10 covering means being configured so that the duration of said process in said  
11 microcosm is controllable,

12 the determination, for environmental treatment purposes, of the effect  
13 of a specified biochemical process in said environment, wherein said  
14 microcosm covering means being configured so that the duration of said  
15 process in said microcosm is controllable,

16 the elucidation of the in situ metabolic activity of a specified  
17 microorganism, wherein at least one of said microcosms having placed therein  
18 an isotope labeled test compound which is to be analyzed for the ratio of light  
19 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

20 the detection of a specified microorganism in said environment,  
21 wherein at least one of said microcosms having placed therein a test  
22 compound suitable for increasing the signal-to-noise ratio of a characteristic  
23 biomarker of said microorganism during mass spectrometric analysis  
24 following in situ biomarker amplification.

25 14. A method as recited in Claim 2, further comprising the step of:

26 before locating said device, configuring a capillary microcosm so as to aid in  
27 addressing research interests chosen from the group consisting of:

28 the identification and linking of the microbial function occurring in  
29 said environment to phylogeny, wherein at least one of said capillaries having  
30 placed therein an isotope labeled test compound that can be used in  
31 conjunction with SIP,

1                   the identification and linking of the microbial function occurring in  
2                   said environment to phylogeny, wherein at least one of said capillaries having  
3                   placed therein an isotope labeled test compound that can be used in  
4                   conjunction with mass spectrometry,

5                   the survival in said environment of a specified microorganism,  
6                   wherein at least one of said capillaries having placed therein said specified  
7                   microorganism,

8                   the fate in said environment of a specified, genetically engineered  
9                   microorganism, wherein at least one of said capillaries is configured to  
10                  contain said genetically engineered microorganism,

11                  the fate in said environment of a specified pathogen, wherein at least  
12                  one of said capillaries is configured to contain said pathogen,

13                  for a specified process in said environment, the effectiveness of  
14                  specified, varying test substances for their ability to accelerate said process,  
15                  wherein said test substances are added to said capillaries,

16                  the identification of microorganisms indigenous to said environment  
17                  that are responsible for a desired bioremediation process in said environment,

18                  the effectiveness of said varying bioremediation strategies for said  
19                  environment, wherein said microcosms are configured to be representative of  
20                  said varying bioremediation strategies,

21                  the effectiveness of said varying bioaugmentation strategies for said  
22                  environment, wherein said microcosms are configured to be representative of  
23                  said varying bioaugmentation strategies,

24                  the effectiveness of said varying chemical treatment strategies for said  
25                  environment, wherein said microcosms are configured to be representative of  
26                  said varying chemical treatment strategies,

27                  the intrinsic transformation rates in said environment when said  
28                  environment is contaminated with a specified contaminant,

29                  the enhanced transformation rates in said environment when said  
30                  environment is contaminated with a specified contaminant, wherein specified  
31                  nutrients are added to said capillary microcosms,

1                   the analysis of the microbial community indigenous to said  
2 environment,

3                   the proteomic analysis of the microbial community indigenous to said  
4 environment,

5                   the discovery within said environment of novel microorganisms of  
6 potential commercial value,

7                   the discovery within said environment of novel biochemical processes  
8 of potential commercial value,

9                   the discovery within said environment of novel natural products of  
10 potential commercial value,

11                   the normalization of the test results achieved with said device for  
12 differences between when and where said tests are conducted, wherein at least  
13 one of said microcosms is configured to serve as an internal standard to which  
14 said results can be normalized,

15                   the means for enhancing the signal-to-noise ratio in the mass  
16 spectrometric analysis of a specified microorganism, wherein at least one of  
17 said microcosm configured to foster the growth of said microorganism while  
18 limiting the growth and survival of other, non-specified microorganisms,

19                   the determination of the fate of a specified compound in said  
20 environment for the purpose of chemical risk assessment, wherein at least one  
21 of said microcosms having placed therein said compound,

22                   the determination of the effect of a specified compound on the  
23 microbial community of said environment for the purpose of chemical risk  
24 assessment, wherein at least one of said microcosms having placed therein  
25 said compound,

26                   the determination of the fate of a specified microorganism for the  
27 purpose of biological risk assessment, wherein at least one of said microcosms  
28 having placed therein said microorganism,

29                   the determination of the effect of a specified microorganism on the  
30 microbial community of said environment for the purpose of biological risk



1           assessment, wherein at least one of said microcosms having placed therein  
2           said specified microorganism,

3                     the determination, for environmental monitoring purposes, of the  
4           effect of a specified agent in said environment, wherein at least one of said  
5           microcosms having placed therein said agent, said placement being such that  
6           said agent is retrievable from said microcosm,

7                     the determination, for risk assessment purposes, of the effect of a  
8           specified agent in said environment, wherein at least one of said microcosms  
9           having placed therein said agent, said placement being such that said agent is  
10          retrievable from said microcosm,

11                    the determination, for environmental treatment purposes of the effect  
12          of a specified agent in said environment, wherein at least one of said  
13          microcosms having placed therein said agent, said placement being such that  
14          said agent is retrievable from said microcosm,

15                    the determination, for environmental monitoring purposes, of the  
16          effect of a specified agent in said environment, wherein at least one of said  
17          microcosms having placed therein said agent and said device being configured  
18          such that said fluid from the surrounding environment that comes into contact  
19          with said agent in said microcosm is retrievable,

20                    the determination, for risk assessment purposes, of the effect of a  
21          specified agent in said environment, wherein at least one of said microcosms  
22          having placed therein said agent and said device being configured such that  
23          said fluid from the surrounding environment that comes into contact with said  
24          agent in said microcosm is retrievable,

25                    the determination, for environment treatment purposes, of the effect of  
26          a specified agent in said environment, wherein at least one of said microcosms  
27          having placed therein said agent and said device being configured such that  
28          said fluid from the surrounding environment that comes into contact with said  
29          agent in said microcosm is retrievable,

30                    the determination, for environmental monitoring purposes, of the  
31          effect of a specified biochemical process in said environment, wherein said

1 microcosm covering means being configured so that the duration of said  
2 process in said microcosm is controllable,

3 the determination, for risk assessment purposes, of the effect of a  
4 specified biochemical process in said environment, wherein said microcosm  
5 covering means being configured so that the duration of said process in said  
6 microcosm is controllable,

7 the determination, for environmental treatment purposes, of the effect  
8 of a specified biochemical process in said environment, wherein said  
9 microcosm covering means being configured so that the duration of said  
10 process in said microcosm is controllable,

11 the elucidation of the in situ metabolic activity of a specified  
12 microorganism, wherein at least one of said microcosms having placed therein  
13 an isotope labeled test compound which is to be analyzed for the ratio of light  
14 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

15 the detection of a specified microorganism in said environment,  
16 wherein at least one of said microcosms having placed therein a test  
17 compound suitable for increasing the signal-to-noise ratio of a characteristic  
18 biomarker of said microorganism during mass spectrometric analysis  
19 following in situ biomarker amplification.

20 15. A method as recited in Claim 3, further comprising the step of:

21 before locating said device, configuring a capillary microcosm so as to aid in  
22 addressing research interests chosen from the group consisting of:

23 the identification and linking of the microbial function occurring in  
24 said environment to phylogeny, wherein at least one of said capillaries having  
25 placed therein an isotope labeled test compound that can be used in  
26 conjunction with SIP,

27 the identification and linking of the microbial function occurring in  
28 said environment to phylogeny, wherein at least one of said capillaries having  
29 placed therein an isotope labeled test compound that can be used in  
30 conjunction with mass spectrometry,

1           the survival in said environment of a specified microorganism,  
2           wherein at least one of said capillaries having placed therein said specified  
3           microorganism,

4           the fate in said environment of a specified, genetically engineered  
5           microorganism, wherein at least one of said capillaries is configured to  
6           contain said genetically engineered microorganism,

7           the fate in said environment of a specified pathogen, wherein at least  
8           one of said capillaries is configured to contain said pathogen,

9           for a specified process in said environment, the effectiveness of  
10          specified, varying test substances for their ability to accelerate said process,  
11          wherein said test substances are added to said capillaries,

12          the identification of microorganisms indigenous to said environment  
13          that are responsible for a desired bioremediation process in said environment,

14          the effectiveness of said varying bioremediation strategies for said  
15          environment, wherein said microcosms are configured to be representative of  
16          said varying bioremediation strategies,

17          the effectiveness of said varying bioaugmentation strategies for said  
18          environment, wherein said microcosms are configured to be representative of  
19          said varying bioaugmentation strategies,

20          the effectiveness of said varying chemical treatment strategies for said  
21          environment, wherein said microcosms are configured to be representative of  
22          said varying chemical treatment strategies,

23          the intrinsic transformation rates in said environment when said  
24          environment is contaminated with a specified contaminant,

25          the enhanced transformation rates in said environment when said  
26          environment is contaminated with a specified contaminant, wherein specified  
27          nutrients are added to said capillary microcosms,

28          the analysis of the microbial community indigenous to said  
29          environment,

30          the proteomic analysis of the microbial community indigenous to said  
31          environment,

1           the discovery within said environment of novel microorganisms of  
2 potential commercial value,

3           the discovery within said environment of novel biochemical processes  
4 of potential commercial value,

5           the discovery within said environment of novel natural products of  
6 potential commercial value,

7           the normalization of the test results achieved with said device for  
8 differences between when and where said tests are conducted, wherein at least  
9 one of said microcosms is configured to serve as an internal standard to which  
10 said results can be normalized,

11           the means for enhancing the signal-to-noise ratio in the mass  
12 spectrometric analysis of a specified microorganism, wherein at least one of  
13 said microcosm configured to foster the growth of said microorganism while  
14 limiting the growth and survival of other, non-specified microorganisms,

15           the determination of the fate of a specified compound in said  
16 environment for the purpose of chemical risk assessment, wherein at least one  
17 of said microcosms having placed therein said compound,

18           the determination of the effect of a specified compound on the  
19 microbial community of said environment for the purpose of chemical risk  
20 assessment, wherein at least one of said microcosms having placed therein  
21 said compound,

22           the determination of the fate of a specified microorganism for the  
23 purpose of biological risk assessment, wherein at least one of said microcosms  
24 having placed therein said microorganism,

25           the determination of the effect of a specified microorganism on the  
26 microbial community of said environment for the purpose of biological risk  
27 assessment, wherein at least one of said microcosms having placed therein  
28 said specified microorganism,

29           the determination, for environmental monitoring purposes, of the  
30 effect of a specified agent in said environment, wherein at least one of said

1 microcosms having placed therein said agent, said placement being such that  
2 said agent is retrievable from said microcosm,

3 the determination, for risk assessment purposes, of the effect of a  
4 specified agent in said environment, wherein at least one of said microcosms  
5 having placed therein said agent, said placement being such that said agent is  
6 retrievable from said microcosm,

7 the determination, for environmental treatment purposes of the effect  
8 of a specified agent in said environment, wherein at least one of said  
9 microcosms having placed therein said agent, said placement being such that  
10 said agent is retrievable from said microcosm,

11 the determination, for environmental monitoring purposes, of the  
12 effect of a specified agent in said environment, wherein at least one of said  
13 microcosms having placed therein said agent and said device being configured  
14 such that said fluid from the surrounding environment that comes into contact  
15 with said agent in said microcosm is retrievable,

16 the determination, for risk assessment purposes, of the effect of a  
17 specified agent in said environment, wherein at least one of said microcosms  
18 having placed therein said agent and said device being configured such that  
19 said fluid from the surrounding environment that comes into contact with said  
20 agent in said microcosm is retrievable,

21 the determination, for environment treatment purposes, of the effect of  
22 a specified agent in said environment, wherein at least one of said microcosms  
23 having placed therein said agent and said device being configured such that  
24 said fluid from the surrounding environment that comes into contact with said  
25 agent in said microcosm is retrievable,

26 the determination, for environmental monitoring purposes, of the  
27 effect of a specified biochemical process in said environment, wherein said  
28 microcosm covering means being configured so that the duration of said  
29 process in said microcosm is controllable,

30 the determination, for risk assessment purposes, of the effect of a  
31 specified biochemical process in said environment, wherein said microcosm

1 covering means being configured so that the duration of said process in said  
2 microcosm is controllable,

3 the determination, for environmental treatment purposes, of the effect  
4 of a specified biochemical process in said environment, wherein said  
5 microcosm covering means being configured so that the duration of said  
6 process in said microcosm is controllable,

7 the elucidation of the in situ metabolic activity of a specified  
8 microorganism, wherein at least one of said microcosms having placed therein  
9 an isotope labeled test compound which is to be analyzed for the ratio of light  
10 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

11 the detection of a specified microorganism in said environment,  
12 wherein at least one of said microcosms having placed therein a test  
13 compound suitable for increasing the signal-to-noise ratio of a characteristic  
14 biomarker of said microorganism during mass spectrometric analysis  
15 following in situ biomarker amplification.

16 16. A method as recited in Claim 4, further comprising the step of:

17 before locating said device, configuring a capillary microcosm so as to aid in  
18 addressing research interests chosen from the group consisting of:

19 the identification and linking of the microbial function occurring in  
20 said environment to phylogeny, wherein at least one of said capillaries having  
21 placed therein an isotope labeled test compound that can be used in  
22 conjunction with SIP,

23 the identification and linking of the microbial function occurring in  
24 said environment to phylogeny, wherein at least one of said capillaries having  
25 placed therein an isotope labeled test compound that can be used in  
26 conjunction with mass spectrometry,

27 the survival in said environment of a specified microorganism,  
28 wherein at least one of said capillaries having placed therein said specified  
29 microorganism,

1           the fate in said environment of a specified, genetically engineered  
2 microorganism, wherein at least one of said capillaries is configured to  
3 contain said genetically engineered microorganism,

4           the fate in said environment of a specified pathogen, wherein at least  
5 one of said capillaries is configured to contain said pathogen,

6           for a specified process in said environment, the effectiveness of  
7 specified, varying test substances for their ability to accelerate said process,  
8 wherein said test substances are added to said capillaries,

9           the identification of microorganisms indigenous to said environment  
10 that are responsible for a desired bioremediation process in said environment,

11           the effectiveness of said varying bioremediation strategies for said  
12 environment, wherein said microcosms are configured to be representative of  
13 said varying bioremediation strategies,

14           the effectiveness of said varying bioaugmentation strategies for said  
15 environment, wherein said microcosms are configured to be representative of  
16 said varying bioaugmentation strategies,

17           the effectiveness of said varying chemical treatment strategies for said  
18 environment, wherein said microcosms are configured to be representative of  
19 said varying chemical treatment strategies,

20           the intrinsic transformation rates in said environment when said  
21 environment is contaminated with a specified contaminant,

22           the enhanced transformation rates in said environment when said  
23 environment is contaminated with a specified contaminant, wherein specified  
24 nutrients are added to said capillary microcosms,

25           the analysis of the microbial community indigenous to said  
26 environment,

27           the proteomic analysis of the microbial community indigenous to said  
28 environment,

29           the discovery within said environment of novel microorganisms of  
30 potential commercial value,

1                   the discovery within said environment of novel biochemical processes  
2 of potential commercial value,

3                   the discovery within said environment of novel natural products of  
4 potential commercial value,

5                   the normalization of the test results achieved with said device for  
6 differences between when and where said tests are conducted, wherein at least  
7 one of said microcosms is configured to serve as an internal standard to which  
8 said results can be normalized,

9                   the means for enhancing the signal-to-noise ratio in the mass  
10 spectrometric analysis of a specified microorganism, wherein at least one of  
11 said microcosm configured to foster the growth of said microorganism while  
12 limiting the growth and survival of other, non-specified microorganisms,

13                   the determination of the fate of a specified compound in said  
14 environment for the purpose of chemical risk assessment, wherein at least one  
15 of said microcosms having placed therein said compound,

16                   the determination of the effect of a specified compound on the  
17 microbial community of said environment for the purpose of chemical risk  
18 assessment, wherein at least one of said microcosms having placed therein  
19 said compound,

20                   the determination of the fate of a specified microorganism for the  
21 purpose of biological risk assessment, wherein at least one of said microcosms  
22 having placed therein said microorganism,

23                   the determination of the effect of a specified microorganism on the  
24 microbial community of said environment for the purpose of biological risk  
25 assessment, wherein at least one of said microcosms having placed therein  
26 said specified microorganism,

27                   the determination, for environmental monitoring purposes, of the  
28 effect of a specified agent in said environment, wherein at least one of said  
29 microcosms having placed therein said agent, said placement being such that  
30 said agent is retrievable from said microcosm,



1           the determination, for risk assessment purposes, of the effect of a  
2           specified agent in said environment, wherein at least one of said microcosms  
3           having placed therein said agent, said placement being such that said agent is  
4           retrievable from said microcosm,

5           the determination, for environmental treatment purposes of the effect  
6           of a specified agent in said environment, wherein at least one of said  
7           microcosms having placed therein said agent, said placement being such that  
8           said agent is retrievable from said microcosm,

9           the determination, for environmental monitoring purposes, of the  
10          effect of a specified agent in said environment, wherein at least one of said  
11          microcosms having placed therein said agent and said device being configured  
12          such that said fluid from the surrounding environment that comes into contact  
13          with said agent in said microcosm is retrievable,

14          the determination, for risk assessment purposes, of the effect of a  
15          specified agent in said environment, wherein at least one of said microcosms  
16          having placed therein said agent and said device being configured such that  
17          said fluid from the surrounding environment that comes into contact with said  
18          agent in said microcosm is retrievable,

19          the determination, for environment treatment purposes, of the effect of  
20          a specified agent in said environment, wherein at least one of said microcosms  
21          having placed therein said agent and said device being configured such that  
22          said fluid from the surrounding environment that comes into contact with said  
23          agent in said microcosm is retrievable,

24          the determination, for environmental monitoring purposes, of the  
25          effect of a specified biochemical process in said environment, wherein said  
26          microcosm covering means being configured so that the duration of said  
27          process in said microcosm is controllable,

28          the determination, for risk assessment purposes, of the effect of a  
29          specified biochemical process in said environment, wherein said microcosm  
30          covering means being configured so that the duration of said process in said  
31          microcosm is controllable,

1                   the determination, for environmental treatment purposes, of the effect  
2                   of a specified biochemical process in said environment, wherein said  
3                   microcosm covering means being configured so that the duration of said  
4                   process in said microcosm is controllable,

5                   the elucidation of the in situ metabolic activity of a specified  
6                   microorganism, wherein at least one of said microcosms having placed therein  
7                   an isotope labeled test compound which is to be analyzed for the ratio of light  
8                   (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

9                   the detection of a specified microorganism in said environment,  
10                  wherein at least one of said microcosms having placed therein a test  
11                  compound suitable for increasing the signal-to-noise ratio of a characteristic  
12                  biomarker of said microorganism during mass spectrometric analysis  
13                  following in situ biomarker amplification.

14       17. A testing device for environmental monitoring and bioprospecting for  
15       microorganisms within a specified environment, said device comprising:

16                  a means for providing a plurality of physically separated, test microcosms that  
17       are so configured as to allow for fluid flow through said microcosms,

18                  a means for containing and protecting said test microcosms as they are placed  
19       in said environment, said means further providing for the flow of fluid from said  
20       surrounding environment to enter and flow through said microcosms, and

21                  a means for covering said fluid flow paths through said microcosms so as to  
22       regulate the flow through said microcosms.

23       18. A testing device as recited in Claim 17:

24                  wherein said plurality of microcosms being configured so as to allow for  
25       automated analysis of said microcosms using commercially available robotics.

26       19. A testing device as recited in Claim 17, further comprising:

27                  a means for causing fluid flow from said surrounding environment and  
28       through said microcosms,

29                  a means for collecting and retaining said fluid flowing through said  
30       microcosms, and

1           a means downstream from said microcosms for preventing backflow of said  
2 fluid into said microcosms.

3 20. A testing device as recited in Claim 18, further comprising:

4           a means for causing fluid flow from said surrounding environment and  
5 through said microcosms,

6           a means for collecting and retaining said fluid flowing through said  
7 microcosms, and

8           a means downstream from said microcosms for preventing backflow of said  
9 fluid into said microcosms.

10 21. A testing device as recited in Claim 17 further comprising a means in at least one  
11 of said microcosms configured for fostering the collection of said microorganisms  
12 that enter said microcosm.

13 22. A testing device as recited in Claim 18 further comprising a means in at least one  
14 of said microcosms configured for fostering the collection of said microorganisms  
15 that enter said microcosm.

16 23. A testing device as recited in Claim 19 further comprising a means in at least one  
17 of said microcosms configured for fostering the collection of said microorganisms  
18 that enter said microcosm.

19 24. A testing device as recited in Claim 20 further comprising a means in at least one  
20 of said microcosms configured for fostering the collection of said microorganisms  
21 that enter said microcosm.

22 25. A testing device as recited in Claim 17 wherein at least one of said microcosms  
23 having a means for containing a specified test substance that can diffuse into the fluid  
24 flowing through said microcosm.

25 26. A testing device as recited in Claim 18 wherein at least one of said microcosms  
26 having a means for containing a specified test substance that can diffuse into the fluid  
27 flowing through said microcosm.

28 27. A testing device as recited in Claim 19 wherein at least one of said microcosms  
29 having a means for containing a specified test substance that can diffuse into the fluid  
30 flowing through said microcosm.

- 1       28. A testing device as recited in Claim 20 wherein at least one of said microcosms  
2       having a means for containing a specified test substance that can diffuse into the fluid  
3       flowing through said microcosm.
- 4       29. A testing device as recited in Claim 17 wherein said plurality of test microcosms  
5       being configured in the form of a rapidly, exchangeable microtiter plate.
- 6       30. A testing device as recited in Claim 18 wherein said plurality of test microcosms  
7       being configured in the form of a rapidly, exchangeable microtiter plate.
- 8       31. A testing device as recited in Claim 19 wherein said plurality of test microcosms  
9       being configured in the form of a rapidly, exchangeable microtiter plate.
- 10      32. A testing device as recited in Claim 20 wherein said plurality of test microcosms  
11      being configured in the form of a rapidly, exchangeable microtiter plate.
- 12      33. A testing device as recited in Claim 29 wherein the content of said microtiter  
13      plate being lyophilized and vacuum sealed.
- 14      34. A testing device as recited in Claim 30 wherein the content of said microtiter  
15      plate being lyophilized and vacuum sealed.
- 16      35. A testing device as recited in Claim 31 wherein the content of said microtiter  
17      plate being lyophilized and vacuum sealed.
- 18      36. A testing device as recited in Claim 32 wherein the content of said microtiter  
19      plate being lyophilized and vacuum sealed.
- 20      37. A testing device as recited in Claim 17, wherein a test microcosm configured so  
21      as to aid in addressing research interests chosen from the group consisting of:
- 22              the identification and linking of the microbial function occurring in  
23              said environment to phylogeny, wherein at least one of said microcosms  
24              having placed therein an isotope labeled test compound that can be used in  
25              conjunction with SIP,
- 26              the identification and linking of the microbial function occurring in  
27              said environment to phylogeny, wherein at least one of said microcosms  
28              having placed therein an isotope labeled test compound that can be used in  
29              conjunction with mass spectrometry,

1           the survival in said environment of a specified microorganism,  
2           wherein at least one of said microcosms having placed therein said specified  
3           microorganism,

4           the fate in said environment of a specified, genetically engineered  
5           microorganism, wherein at least one of said microcosms is configured to  
6           contain said genetically engineered microorganism,

7           the fate in said environment of a specified pathogen, wherein at least  
8           one of said microcosms is configured to contain said pathogen,

9           for a specified process in said environment, the effectiveness of  
10          specified, varying test substances for their ability to accelerate said process,  
11          wherein said test substances are added to said microcosms,

12          the identification of microorganisms indigenous to said environment  
13          that are responsible for a desired bioremediation process in said environment,

14          the effectiveness of said varying bioremediation strategies for said  
15          environment, wherein said microcosms are configured to be representative of  
16          said varying bioremediation strategies,

17          the effectiveness of said varying bioaugmentation strategies for said  
18          environment, wherein said microcosms are configured to be representative of  
19          said varying bioaugmentation strategies,

20          the effectiveness of said varying chemical treatment strategies for said  
21          environment, wherein said microcosms are configured to be representative of  
22          said varying chemical treatment strategies,

23          the intrinsic transformation rates in said environment when said  
24          environment is contaminated with a specified contaminant,

25          the enhanced transformation rates in said environment when said  
26          environment is contaminated with a specified contaminant, wherein specified  
27          nutrients are added to said microcosms,

28          the analysis of the microbial community indigenous to said  
29          environment,

30          the proteomic analysis of the microbial community indigenous to said  
31          environment,

1           the discovery within said environment of novel microorganisms of  
2 potential commercial value,

3           the discovery within said environment of novel biochemical processes  
4 of potential commercial value,

5           the discovery within said environment of novel natural products of  
6 potential commercial value,

7           the normalization of the test results achieved with said device for  
8 differences between when and where said tests are conducted, wherein at least  
9 one of said microcosms is configured to serve as an internal standard to which  
10 said results can be normalized,

11          the means for enhancing the signal-to-noise ratio in the mass  
12 spectrometric analysis of a specified microorganism, wherein at least one of  
13 said microcosm configured to foster the growth of said microorganism while  
14 limiting the growth and survival of other, non-specified microorganisms,

15          the determination of the fate of a specified compound in said  
16 environment for the purpose of chemical risk assessment, wherein at least one  
17 of said microcosms having placed therein said compound,

18          the determination of the effect of a specified compound on the  
19 microbial community of said environment for the purpose of chemical risk  
20 assessment, wherein at least one of said microcosms having placed therein  
21 said compound,

22          the determination of the fate of a specified microorganism for the  
23 purpose of biological risk assessment, wherein at least one of said microcosms  
24 having placed therein said microorganism,

25          the determination of the effect of a specified microorganism on the  
26 microbial community of said environment for the purpose of biological risk  
27 assessment, wherein at least one of said microcosms having placed therein  
28 said specified microorganism,

29          the determination, for environmental monitoring purposes, of the  
30 effect of a specified agent in said environment, wherein at least one of said

1 microcosms having placed therein said agent, said placement being such that  
2 said agent is retrievable from said microcosm,

3 the determination, for risk assessment purposes, of the effect of a  
4 specified agent in said environment, wherein at least one of said microcosms  
5 having placed therein said agent, said placement being such that said agent is  
6 retrievable from said microcosm,

7 the determination, for environmental treatment purposes of the effect  
8 of a specified agent in said environment, wherein at least one of said  
9 microcosms having placed therein said agent, said placement being such that  
10 said agent is retrievable from said microcosm,

11 the determination, for environmental monitoring purposes, of the  
12 effect of a specified agent in said environment, wherein at least one of said  
13 microcosms having placed therein said agent and said device being configured  
14 such that said fluid from the surrounding environment that comes into contact  
15 with said agent in said microcosm is retrievable,

16 the determination, for risk assessment purposes, of the effect of a  
17 specified agent in said environment, wherein at least one of said microcosms  
18 having placed therein said agent and said device being configured such that  
19 said fluid from the surrounding environment that comes into contact with said  
20 agent in said microcosm is retrievable,

21 the determination, for environment treatment purposes, of the effect of  
22 a specified agent in said environment, wherein at least one of said microcosms  
23 having placed therein said agent and said device being configured such that  
24 said fluid from the surrounding environment that comes into contact with said  
25 agent in said microcosm is retrievable,

26 the determination, for environmental monitoring purposes, of the  
27 effect of a specified biochemical process in said environment, wherein said  
28 microcosm covering means being configured so that the duration of said  
29 process in said microcosm is controllable,

30 the determination, for risk assessment purposes, of the effect of a  
31 specified biochemical process in said environment, wherein said microcosm

1 covering means being configured so that the duration of said process in said  
2 microcosm is controllable,

3 the determination, for environmental treatment purposes, of the effect  
4 of a specified biochemical process in said environment, wherein said  
5 microcosm covering means being configured so that the duration of said  
6 process in said microcosm is controllable,

7 the elucidation of the in situ metabolic activity of a specified  
8 microorganism, wherein at least one of said microcosms having placed therein  
9 an isotope labeled test compound which is to be analyzed for the ratio of light  
10 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

11 the detection of a specified microorganism in said environment,  
12 wherein at least one of said microcosms having placed therein a test  
13 compound suitable for increasing the signal-to-noise ratio of a characteristic  
14 biomarker of said microorganism during mass spectrometric analysis  
15 following in situ biomarker amplification.

16 38. A testing device as recited in Claim 18, wherein a test microcosm configured so  
17 as to aid in addressing research interests chosen from the group consisting of:

18 the identification and linking of the microbial function occurring in  
19 said environment to phylogeny, wherein at least one of said microcosms  
20 having placed therein an isotope labeled test compound that can be used in  
21 conjunction with SIP,

22 the identification and linking of the microbial function occurring in  
23 said environment to phylogeny, wherein at least one of said microcosms  
24 having placed therein an isotope labeled test compound that can be used in  
25 conjunction with mass spectrometry,

26 the survival in said environment of a specified microorganism,  
27 wherein at least one of said microcosms having placed therein said specified  
28 microorganism,

29 the fate in said environment of a specified, genetically engineered  
30 microorganism, wherein at least one of said microcosms is configured to  
31 contain said genetically engineered microorganism,



1           the fate in said environment of a specified pathogen, wherein at least  
2 one of said microcosms is configured to contain said pathogen,

3           for a specified process in said environment, the effectiveness of  
4 specified, varying test substances for their ability to accelerate said process,  
5 wherein said test substances are added to said microcosms,

6           the identification of microorganisms indigenous to said environment  
7 that are responsible for a desired bioremediation process in said environment,

8           the effectiveness of said varying bioremediation strategies for said  
9 environment, wherein said microcosms are configured to be representative of  
10 said varying bioremediation strategies,

11          the effectiveness of said varying bioaugmentation strategies for said  
12 environment, wherein said microcosms are configured to be representative of  
13 said varying bioaugmentation strategies,

14          the effectiveness of said varying chemical treatment strategies for said  
15 environment, wherein said microcosms are configured to be representative of  
16 said varying chemical treatment strategies,

17          the intrinsic transformation rates in said environment when said  
18 environment is contaminated with a specified contaminant,

19          the enhanced transformation rates in said environment when said  
20 environment is contaminated with a specified contaminant, wherein specified  
21 nutrients are added to said microcosms,

22          the analysis of the microbial community indigenous to said  
23 environment,

24          the proteomic analysis of the microbial community indigenous to said  
25 environment,

26          the discovery within said environment of novel microorganisms of  
27 potential commercial value,

28          the discovery within said environment of novel biochemical processes  
29 of potential commercial value,

30          the discovery within said environment of novel natural products of  
31 potential commercial value,

1           the normalization of the test results achieved with said device for  
2 differences between when and where said tests are conducted, wherein at least  
3 one of said microcosms is configured to serve as an internal standard to which  
4 said results can be normalized,

5           the means for enhancing the signal-to-noise ratio in the mass  
6 spectrometric analysis of a specified microorganism, wherein at least one of  
7 said microcosm configured to foster the growth of said microorganism while  
8 limiting the growth and survival of other, non-specified microorganisms,

9           the determination of the fate of a specified compound in said  
10 environment for the purpose of chemical risk assessment, wherein at least one  
11 of said microcosms having placed therein said compound,

12           the determination of the effect of a specified compound on the  
13 microbial community of said environment for the purpose of chemical risk  
14 assessment, wherein at least one of said microcosms having placed therein  
15 said compound,

16           the determination of the fate of a specified microorganism for the  
17 purpose of biological risk assessment, wherein at least one of said microcosms  
18 having placed therein said microorganism,

19           the determination of the effect of a specified microorganism on the  
20 microbial community of said environment for the purpose of biological risk  
21 assessment, wherein at least one of said microcosms having placed therein  
22 said specified microorganism,

23           the determination, for environmental monitoring purposes, of the  
24 effect of a specified agent in said environment, wherein at least one of said  
25 microcosms having placed therein said agent, said placement being such that  
26 said agent is retrievable from said microcosm,

27           the determination, for risk assessment purposes, of the effect of a  
28 specified agent in said environment, wherein at least one of said microcosms  
29 having placed therein said agent, said placement being such that said agent is  
30 retrievable from said microcosm,

1           the determination, for environmental treatment purposes of the effect  
2 of a specified agent in said environment, wherein at least one of said  
3 microcosms having placed therein said agent, said placement being such that  
4 said agent is retrievable from said microcosm,

5           the determination, for environmental monitoring purposes, of the  
6 effect of a specified agent in said environment, wherein at least one of said  
7 microcosms having placed therein said agent and said device being configured  
8 such that said fluid from the surrounding environment that comes into contact  
9 with said agent in said microcosm is retrievable,

10          the determination, for risk assessment purposes, of the effect of a  
11 specified agent in said environment, wherein at least one of said microcosms  
12 having placed therein said agent and said device being configured such that  
13 said fluid from the surrounding environment that comes into contact with said  
14 agent in said microcosm is retrievable,

15          the determination, for environment treatment purposes, of the effect of  
16 a specified agent in said environment, wherein at least one of said microcosms  
17 having placed therein said agent and said device being configured such that  
18 said fluid from the surrounding environment that comes into contact with said  
19 agent in said microcosm is retrievable,

20          the determination, for environmental monitoring purposes, of the  
21 effect of a specified biochemical process in said environment, wherein said  
22 microcosm covering means being configured so that the duration of said  
23 process in said microcosm is controllable,

24          the determination, for risk assessment purposes, of the effect of a  
25 specified biochemical process in said environment, wherein said microcosm  
26 covering means being configured so that the duration of said process in said  
27 microcosm is controllable,

28          the determination, for environmental treatment purposes, of the effect  
29 of a specified biochemical process in said environment, wherein said  
30 microcosm covering means being configured so that the duration of said  
31 process in said microcosm is controllable,

1           the elucidation of the in situ metabolic activity of a specified  
2           microorganism, wherein at least one of said microcosms having placed therein  
3           an isotope labeled test compound which is to be analyzed for the ratio of light  
4           (non-labeled) and heavy (labeled) biomarkers of said microorganism, or  
5           the detection of a specified microorganism in said environment,  
6           wherein at least one of said microcosms having placed therein a test  
7           compound suitable for increasing the signal-to-noise ratio of a characteristic  
8           biomarker of said microorganism during mass spectrometric analysis  
9           following in situ biomarker amplification.

10       39. A testing device as recited in Claim 19, wherein a test microcosm configured so  
11       as to aid in addressing research interests chosen from the group consisting of:

12           the identification and linking of the microbial function occurring in  
13           said environment to phylogeny, wherein at least one of said microcosms  
14           having placed therein an isotope labeled test compound that can be used in  
15           conjunction with SIP,

16           the identification and linking of the microbial function occurring in  
17           said environment to phylogeny, wherein at least one of said microcosms  
18           having placed therein an isotope labeled test compound that can be used in  
19           conjunction with mass spectrometry,

20           the survival in said environment of a specified microorganism,  
21           wherein at least one of said microcosms having placed therein said specified  
22           microorganism,

23           the fate in said environment of a specified, genetically engineered  
24           microorganism, wherein at least one of said microcosms is configured to  
25           contain said genetically engineered microorganism,

26           the fate in said environment of a specified pathogen, wherein at least  
27           one of said microcosms is configured to contain said pathogen,

28           for a specified process in said environment, the effectiveness of  
29           specified, varying test substances for their ability to accelerate said process,  
30           wherein said test substances are added to said microcosms,

1           the identification of microorganisms indigenous to said environment  
2           that are responsible for a desired bioremediation process in said environment,  
3           the effectiveness of said varying bioremediation strategies for said  
4           environment, wherein said microcosms are configured to be representative of  
5           said varying bioremediation strategies,

6           the effectiveness of said varying bioaugmentation strategies for said  
7           environment, wherein said microcosms are configured to be representative of  
8           said varying bioaugmentation strategies,

9           the effectiveness of said varying chemical treatment strategies for said  
10          environment, wherein said microcosms are configured to be representative of  
11          said varying chemical treatment strategies,

12          the intrinsic transformation rates in said environment when said  
13          environment is contaminated with a specified contaminant,

14          the enhanced transformation rates in said environment when said  
15          environment is contaminated with a specified contaminant, wherein specified  
16          nutrients are added to said microcosms,

17          the analysis of the microbial community indigenous to said  
18          environment,

19          the proteomic analysis of the microbial community indigenous to said  
20          environment,

21          the discovery within said environment of novel microorganisms of  
22          potential commercial value,

23          the discovery within said environment of novel biochemical processes  
24          of potential commercial value,

25          the discovery within said environment of novel natural products of  
26          potential commercial value,

27          the normalization of the test results achieved with said device for  
28          differences between when and where said tests are conducted, wherein at least  
29          one of said microcosms is configured to serve as an internal standard to which  
30          said results can be normalized,

1           the means for enhancing the signal-to-noise ratio in the mass  
2 spectrometric analysis of a specified microorganism, wherein at least one of  
3 said microcosm configured to foster the growth of said microorganism while  
4 limiting the growth and survival of other, non-specified microorganisms,

5           the determination of the fate of a specified compound in said  
6 environment for the purpose of chemical risk assessment, wherein at least one  
7 of said microcosms having placed therein said compound,

8           the determination of the effect of a specified compound on the  
9 microbial community of said environment for the purpose of chemical risk  
10 assessment, wherein at least one of said microcosms having placed therein  
11 said compound,

12          the determination of the fate of a specified microorganism for the  
13 purpose of biological risk assessment, wherein at least one of said microcosms  
14 having placed therein said microorganism,

15          the determination of the effect of a specified microorganism on the  
16 microbial community of said environment for the purpose of biological risk  
17 assessment, wherein at least one of said microcosms having placed therein  
18 said specified microorganism,

19          the determination, for environmental monitoring purposes, of the  
20 effect of a specified agent in said environment, wherein at least one of said  
21 microcosms having placed therein said agent, said placement being such that  
22 said agent is retrievable from said microcosm,

23          the determination, for risk assessment purposes, of the effect of a  
24 specified agent in said environment, wherein at least one of said microcosms  
25 having placed therein said agent, said placement being such that said agent is  
26 retrievable from said microcosm,

27          the determination, for environmental treatment purposes of the effect  
28 of a specified agent in said environment, wherein at least one of said  
29 microcosms having placed therein said agent, said placement being such that  
30 said agent is retrievable from said microcosm,

1           the determination, for environmental monitoring purposes, of the  
2 effect of a specified agent in said environment, wherein at least one of said  
3 microcosms having placed therein said agent and said device being configured  
4 such that said fluid from the surrounding environment that comes into contact  
5 with said agent in said microcosm is retrievable,

6           the determination, for risk assessment purposes, of the effect of a  
7 specified agent in said environment, wherein at least one of said microcosms  
8 having placed therein said agent and said device being configured such that  
9 said fluid from the surrounding environment that comes into contact with said  
10 agent in said microcosm is retrievable,

11          the determination, for environment treatment purposes, of the effect of  
12 a specified agent in said environment, wherein at least one of said microcosms  
13 having placed therein said agent and said device being configured such that  
14 said fluid from the surrounding environment that comes into contact with said  
15 agent in said microcosm is retrievable,

16          the determination, for environmental monitoring purposes, of the  
17 effect of a specified biochemical process in said environment, wherein said  
18 microcosm covering means being configured so that the duration of said  
19 process in said microcosm is controllable,

20          the determination, for risk assessment purposes, of the effect of a  
21 specified biochemical process in said environment, wherein said microcosm  
22 covering means being configured so that the duration of said process in said  
23 microcosm is controllable,

24          the determination, for environmental treatment purposes, of the effect  
25 of a specified biochemical process in said environment, wherein said  
26 microcosm covering means being configured so that the duration of said  
27 process in said microcosm is controllable,

28          the elucidation of the in situ metabolic activity of a specified  
29 microorganism, wherein at least one of said microcosms having placed therein  
30 an isotope labeled test compound which is to be analyzed for the ratio of light  
31 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

1                   the detection of a specified microorganism in said environment,  
2                   wherein at least one of said microcosms having placed therein a test  
3                   compound suitable for increasing the signal-to-noise ratio of a characteristic  
4                   biomarker of said microorganism during mass spectrometric analysis  
5                   following in situ biomarker amplification.

6       40. A testing device as recited in Claim 20, wherein a test microcosm configured so  
7       as to aid in addressing research interests chosen from the group consisting of:

8                   the identification and linking of the microbial function occurring in  
9                   said environment to phylogeny, wherein at least one of said microcosms  
10                  having placed therein an isotope labeled test compound that can be used in  
11                  conjunction with SIP,

12                  the identification and linking of the microbial function occurring in  
13                  said environment to phylogeny, wherein at least one of said microcosms  
14                  having placed therein an isotope labeled test compound that can be used in  
15                  conjunction with mass spectrometry,

16                  the survival in said environment of a specified microorganism,  
17                  wherein at least one of said microcosms having placed therein said specified  
18                  microorganism,

19                  the fate in said environment of a specified, genetically engineered  
20                  microorganism, wherein at least one of said microcosms is configured to  
21                  contain said genetically engineered microorganism,

22                  the fate in said environment of a specified pathogen, wherein at least  
23                  one of said microcosms is configured to contain said pathogen,

24                  for a specified process in said environment, the effectiveness of  
25                  specified, varying test substances for their ability to accelerate said process,  
26                  wherein said test substances are added to said microcosms,

27                  the identification of microorganisms indigenous to said environment  
28                  that are responsible for a desired bioremediation process in said environment,

29                  the effectiveness of said varying bioremediation strategies for said  
30                  environment, wherein said microcosms are configured to be representative of  
31                  said varying bioremediation strategies,



1           the effectiveness of said varying bioaugmentation strategies for said  
2 environment, wherein said microcosms are configured to be representative of  
3 said varying bioaugmentation strategies,

4           the effectiveness of said varying chemical treatment strategies for said  
5 environment, wherein said microcosms are configured to be representative of  
6 said varying chemical treatment strategies,

7           the intrinsic transformation rates in said environment when said  
8 environment is contaminated with a specified contaminant,

9           the enhanced transformation rates in said environment when said  
10 environment is contaminated with a specified contaminant, wherein specified  
11 nutrients are added to said microcosms,

12           the analysis of the microbial community indigenous to said  
13 environment,

14           the proteomic analysis of the microbial community indigenous to said  
15 environment,

16           the discovery within said environment of novel microorganisms of  
17 potential commercial value,

18           the discovery within said environment of novel biochemical processes  
19 of potential commercial value,

20           the discovery within said environment of novel natural products of  
21 potential commercial value,

22           the normalization of the test results achieved with said device for  
23 differences between when and where said tests are conducted, wherein at least  
24 one of said microcosms is configured to serve as an internal standard to which  
25 said results can be normalized,

26           the means for enhancing the signal-to-noise ratio in the mass  
27 spectrometric analysis of a specified microorganism, wherein at least one of  
28 said microcosm configured to foster the growth of said microorganism while  
29 limiting the growth and survival of other, non-specified microorganisms,

1           the determination of the fate of a specified compound in said  
2 environment for the purpose of chemical risk assessment, wherein at least one  
3 of said microcosms having placed therein said compound,

4           the determination of the effect of a specified compound on the  
5 microbial community of said environment for the purpose of chemical risk  
6 assessment, wherein at least one of said microcosms having placed therein  
7 said compound,

8           the determination of the fate of a specified microorganism for the  
9 purpose of biological risk assessment, wherein at least one of said microcosms  
10 having placed therein said microorganism,

11          the determination of the effect of a specified microorganism on the  
12 microbial community of said environment for the purpose of biological risk  
13 assessment, wherein at least one of said microcosms having placed therein  
14 said specified microorganism,

15          the determination, for environmental monitoring purposes, of the  
16 effect of a specified agent in said environment, wherein at least one of said  
17 microcosms having placed therein said agent, said placement being such that  
18 said agent is retrievable from said microcosm,

19          the determination, for risk assessment purposes, of the effect of a  
20 specified agent in said environment, wherein at least one of said microcosms  
21 having placed therein said agent, said placement being such that said agent is  
22 retrievable from said microcosm,

23          the determination, for environmental treatment purposes of the effect  
24 of a specified agent in said environment, wherein at least one of said  
25 microcosms having placed therein said agent, said placement being such that  
26 said agent is retrievable from said microcosm,

27          the determination, for environmental monitoring purposes, of the  
28 effect of a specified agent in said environment, wherein at least one of said  
29 microcosms having placed therein said agent and said device being configured  
30 such that said fluid from the surrounding environment that comes into contact  
31 with said agent in said microcosm is retrievable,

1           the determination, for risk assessment purposes, of the effect of a  
2           specified agent in said environment, wherein at least one of said microcosms  
3           having placed therein said agent and said device being configured such that  
4           said fluid from the surrounding environment that comes into contact with said  
5           agent in said microcosm is retrievable,

6           the determination, for environment treatment purposes, of the effect of  
7           a specified agent in said environment, wherein at least one of said microcosms  
8           having placed therein said agent and said device being configured such that  
9           said fluid from the surrounding environment that comes into contact with said  
10          agent in said microcosm is retrievable,

11          the determination, for environmental monitoring purposes, of the  
12          effect of a specified biochemical process in said environment, wherein said  
13          microcosm covering means being configured so that the duration of said  
14          process in said microcosm is controllable,

15          the determination, for risk assessment purposes, of the effect of a  
16          specified biochemical process in said environment, wherein said microcosm  
17          covering means being configured so that the duration of said process in said  
18          microcosm is controllable,

19          the determination, for environmental treatment purposes, of the effect  
20          of a specified biochemical process in said environment, wherein said  
21          microcosm covering means being configured so that the duration of said  
22          process in said microcosm is controllable,

23          the elucidation of the in situ metabolic activity of a specified  
24          microorganism, wherein at least one of said microcosms having placed therein  
25          an isotope labeled test compound which is to be analyzed for the ratio of light  
26          (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

27          the detection of a specified microorganism in said environment,  
28          wherein at least one of said microcosms having placed therein a test  
29          compound suitable for increasing the signal-to-noise ratio of a characteristic  
30          biomarker of said microorganism during mass spectrometric analysis  
31          following in situ biomarker amplification.

- 1        41. A testing device as recited in Claim 17, further comprising a means for remotely  
2        controlling the operation of said means for covering said microcosm fluid flow paths.
- 3        42. A testing device as recited in Claim 18, further comprising a means for remotely  
4        controlling the operation of said means for covering said microcosm fluid flow paths  
5        and said means for causing fluid flow through said microcosms.
- 6        43. A testing device as recited in Claim 19, further comprising a means for remotely  
7        controlling the operation of said means for covering said microcosm fluid flow paths.
- 8        44. A testing device as recited in Claim 20, further comprising a means for remotely  
9        controlling the operation of said means for covering said microcosm fluid flow paths  
10       and said means for causing fluid flow through said microcosms.